

Claims

- 1 1. A computerized method of video analysis, the method comprising:
 - 2 receiving image data for a plurality of video frames depicting a scene that includes at
 - 3 least one of a plurality of background features, wherein (i) each of the video frames comprises a
 - 4 plurality of image regions and (ii) at least one video frame has an object within at least one
 - 5 image region;
 - 6 providing a plurality of background classifications each corresponding to one of the
 - 7 background features in the scene; and
 - 8 assigning one of the background classifications to at least one of the image regions based
 - 9 at least in part on a location of the object relative to the image regions.
- 1 2. The method of claim 1 wherein one of the background classifications is a floor.
- 1 3. The method of claim 1 wherein the assigning of a background classification to an image
2 region further comprises comparing a value associated with the image region to a floor threshold.
- 1 4. The method of claim 1 wherein one of the background classifications is an obstruction.
- 1 5. The method claim 1 wherein the assigning of a background classification to an image region
2 further comprises:
 - 3 comparing a value associated with the image region to a floor threshold; and
 - 4 comparing a value associated with the image region to an obstruction threshold.
- 1 6. The method of claim 1 wherein one of the background classifications is a portal.
- 1 7. The method of claim 1 further comprising:
 - 2 determining for each video frame whether an object has newly appeared in such video
 - 3 frame; and
 - 4 determining the image regions in which the newly appeared objects are present.

1 8. The method of claim 7 wherein the assigning of a background classification to an image
2 region further comprises counting the number of newly appeared objects that first appeared in
3 the image region.

1 9. The method of claim 1 further comprising:

2 determining for each video frame whether an object has newly disappeared in such video
3 frame; and

4 determining the image regions in which the newly disappeared objects were last present
5 in a previous video frame.

1 10. The method of claim 9 wherein the assigning of a background classification to an image
2 region further comprises counting the number of disappeared objects that disappeared from the
3 image region.

1 11. The method of claim 1 further comprising determining whether to track the object based at
2 least in part on the background classification assigned to at least one of the image regions of the
3 video frame.

1 12. The method of claim 1 wherein the object further comprises a boundary, the method further
2 comprising the step of determining at least one boundary region that includes the boundary of the
3 object.

1 13. The method of claim 1 wherein the object further comprises a boundary, the method further
2 comprising the step of determining at least one boundary region that includes at least one of the
3 top, bottom, and side boundaries of the object.

1 14. The method of claim 13 further comprising determining whether to track the object based at
2 least in part on the image regions in which the at least one boundary region is included relative to

the background classification assigned to at least one of (i) such image regions and (ii) another image region in the video frame.

15. The method of claim 1 further comprising determining whether to track the object based at least in part on the size of the object.

16. The method of claim 1 further comprising determining whether to track the object based at least in part on (i) the size of the object and (ii) the image regions in which the object is present relative to the background classification assigned to at least one of (a) such image regions and (b) another image region.

17. The method of claim 1 further comprising:

- selecting one of the video frames that has an object; and
- determining whether the object appears in one of the other video frames based at least in part on the background classification assigned to one of the image regions.

18. The method of claim 1 further comprising:

- selecting one of the video frames that has an object; and
- determining whether the object appears in one of the other video frames at one of an earlier and later time based on the background classification assigned to one of the image regions.

19. A computerized method of video analysis, the method comprising:

- receiving image data for a plurality of video frames depicting a scene, wherein at least one video frame has an object within such frame; and
- determining a vanishing point for such frame based at least in part on one or more characteristics of the object and the vanishing point of other frames.

1 20. The method of claim 19 further comprising determining the vertical vanishing point for such
2 frame based at least in part on one or more characteristics of the object and the vertical vanishing
3 point of other frames.

1 21. The method of claim 20 wherein the determining of the vertical vanishing point is further
2 based at least on one of a major axis of the object and a centroid of the object.

1 22. The method of claim 19, wherein (i) the object further comprises a boundary and (ii) the
2 boundary further comprises plurality of pixels, the method further comprising selecting at least
3 one the pixels of the boundary based at least in part on the vanishing point of the frame.

1 23. The method of claim 21 wherein (i) the object further comprises a boundary, the boundary
2 having a bottom, and (ii) the boundary further comprises plurality of pixels, the method further
3 comprising selecting at least one pixel that corresponds to the boundary bottom based at least in
4 part on the vertical vanishing point of the frame.

1 24. A computerized method for video analysis, the method comprising:

2 receiving image data for a plurality of video frames depicting a scene that includes at
3 least one of a plurality of background features, wherein (i) each of the video frames comprises a
4 plurality of image regions, and (ii) at least one video frame has an object within at least one
5 image region, the object having a lower boundary;

6 providing a plurality of background classifications each corresponding to one of the
7 background features in the scene;

8 determining a vertical vanishing point for the at least one frame in which there is an
9 object based at least in part on one or more characteristics of such object and based on the
10 vertical vanishing point of other frames;

11 determining the lower boundary of the object;

12 assigning one of the background classifications to at least one image region based at least
13 in part on the location of the lower boundary of the object in the frame relative to the image
14 region.

1 25. The method of claim 24 further comprising counting the number of frames in which a lower
2 boundary of an object is present in each image region.

1 26. The method of claim 25 further comprising counting the number of frames in which an
2 object is present in each image region.

1 27. The method of claim 26 wherein the assigning of one of the background classifications to at
2 least one image region further comprises comparing the number of frames in which a lower
3 boundary of an object is present in the image region to a floor threshold.

1 28. The method of claim 27 wherein the assigning of one of the background classifications to at
2 least one image region further comprises comparing the number of frames in which an object is
3 present in the image region to an obstruction threshold.

1 29. A video analysis system comprising:

2 means for receiving image data for a plurality of video frames depicting a scene that
3 includes at least one of a plurality of background features, wherein (i) each of the video frames
4 comprises a plurality of image regions and (ii) at least one video frame has an object within at
5 least one image region;

6 means for providing a plurality of background classifications each corresponding to one
7 of the background features in the scene; and

8 means for assigning one of the background classifications to at least one of the image
9 regions based at least in part on a location of the object relative to the image regions.

1 30. A video analysis system comprising:

- 2 means for receiving image data for a plurality of video frames depicting a scene, wherein
- 3 at least one video frame has an object within such frame; and
- 4 means for determining a vanishing point for such frame based at least in part on one or
- 5 more characteristics of the object and the vanishing point of other frames.